# NOTES AND LITERATURE

## AMERICAN PERMIAN VERTEBRATES[1]

THIS work might have been entitled Some American Permian Vertebrates. It is not a general treatise on the vertebrates found in the Permian of America, but one on a few amphibians and a number of reptiles to which the author has recently been giving his attention. The book is, however, not less valuable because of its limitations.

For a number of years Dr. Williston has been making collections from the Permian deposits of Texas. He has been studying these collections, as well as the materials secured by Cope and now in the American Museum of Natural History in New York, and the collections, now in Yale University, brought together by Marsh. Dr. Williston has found some remarkably well preserved remains and these have been most skillfully prepared by his assistant, Mr. Paul Miller; and in this book we have some of the results of their labor.

Thanks to Williston, Broili, and Case, our knowledge of the interesting animals of the Permian has been greatly increased. We seem to be justified in believing that during the Permian the principal orders of reptiles took their origin, or at most had not yet diverged far from the parent stem. It is therefore of the highest importance that every scrap of materials be studied that is likely to throw light on these reptiles and their relationships.

As it seems necessary for a reviewer to discover some errors and deficiencies, some fly in the ointment, let this duty be first accomplished.

The text is well printed and the text-figures well made and effective. Most of the plates are excellent, especially these made after drawings. Those reproduced from photographs, as Plates XXVI–XXVIII, are useful mainly in showing that the author had a sufficient basis for his line drawings. These Permian fossils are very refractory subjects for photography, being variously mottled and stained. There are, however, methods for

[1] "American Permian Vertebrates," by Samuel W. Williston, professor of paleontology in the University of Chicago. The University of Chicago Press, Chicago, Ill. Pp. 145; 38 plates and 32 text-figures. Price $2.50 net, $2.68 postpaid.

hiding such stains and giving the objects a uniform color, so that light and shade produced by the varying surfaces need not be interfered with; and it might be well to test these methods on such fossils.

The reader, at least this one, can not always determine the exact size of the animals described; for example, that of *Seymouria baylorensis*. On page 140 we are told that the figures of the plates are of the natural size, unless otherwise stated, wherefore we might conclude that the figure on Plate XXVI is of the size of nature. However, on pages 51 and 52 the figures of the same skull are explained as being one half the natural size, and they are somewhat more than two thirds the size of the skull of Plate XXVI. As the author seems not to state the size of the animal we are left in doubt.

The present writer would suggest that the important Plate V ought to have had its figures lettered so as to indicate what names the author intended to apply to the various elements. By digging in the text with sufficient assiduity the unfamiliar student may, after struggling perhaps with such expressions as "the real, so-called coracoid" (p. 57) and "the so-called true coracoid" (pp. 97, 100), determine to what parts the various terms are to be applied.

Inasmuch as Dr. Williston argues that the exact content of the terms Theromorpha and Pelycosauria and the exact relationships of the groups can not yet be determined, it would appear better to have retained Pelycosauria for the order which he calls Theromorpha, especially since Case has employed Pelycosauria in his monograph on the group. It is still more difficult to follow Dr. Williston in displacing the well-founded family name Clepsydropidæ in favor of Sphenacodontidæ; when, according to his own researches, the genus *Sphenacodon*, with great probability, does not belong in the same family as *Clepsydrops*.

Having uttered these mild complaints, it is a pleasure to recognize the value of the services rendered to science by Dr. Williston in his descriptions of *Limnoscelis paludis, Seymouria baylorensis, Varanosaurus brevirostris* and *Casea broilii*. These descriptions are based on materials so complete and so abundant that practically the whole osteology of each is known. The remains form a marked contrast with those on which Cope was compelled to found most of his work on the Permian reptiles and amphibians.

The genera *Limnoscelis* and *Seymouria* belong to the Cotylosauria; *Varanosaurus* and *Casea* to the Theromorpha. The types of *Limnoscelis paludis* are in Yale University, and were collected many years ago in New Mexico for Marsh. One specimen is a skeleton lacking only the skull, the front feet and a part of one hind foot; the other lacks only parts of the hinder feet. And all these parts are in their natural positions! What more can the paleontologist desire? Doubtless he will regret that the animal had not fallen into some pool of asphalt that had the property of preserving the flesh and internal organs. The principal skeleton described by Williston had a length of about 7 feet.

The genus *Seymouria* was originally described by Broili on two skulls obtained in Texas. Williston secured in 1910 a specimen of another species of the genus and this specimen had missing only a part of the tail; and he expects yet to secure even this. The bones are all in the closest natural articulation and are neither distorted nor compressed. This reptile was about 2 feet long.

*Varanosaurus* was described by Broili on a skull and part of a skeleton. Williston has secured of another species 25 skeletons, of which 6 or 8 have been recovered in greater or less perfection from the matrix. He figures a mounted skeleton and states that it measures just 44 inches in length. The head is long, narrow and pointed in front.

*Casea broilii* was a reptile about 3 feet in length. Its head is small, short, broad and deep. Williston presents a figure of a restoration composed of three individuals; but he thinks that in his collection there remain other skeletons. Among the peculiarities of the reptile are a large parietal foramen and a large infratemporal vacuity.

Dr. Williston presents at length the structural features that belong to the two orders Cotylosauria and Theromorpha. These are very instructive; but when we compare the two sets of characters we find that nearly all of them are either common to the two orders or of no great value. The Cotylosauria, however, possess no temporal vacuities, while the Theromorpha have one on each side. The former are said to have the lachrymal prolonged to the anterior nares; the latter not so. However, the figure, 25, of *Varanosaurus* represents this bone as reaching the nostril.

Williston evidently regards the presence of a temporal vacuity as sufficient to justify the separation of *Varanosaurus* and *Casea* from the Cotylosauria; and he may be right. His position could not be questioned if it could be shown that the presence or the absence of this feature indicated the divergence of two phyla; that the one group gave origin to descendants that retained the temporal roof intact, while the other started a line that developed one or two vacuities on each side. However, that proposition can hardly be proved as yet.

In *Varanosaurus* the temporal roof is mostly lacking and there is no lower temporal arch, differing in the latter respect greatly from *Casea*. Dr. Williston is led to discuss the value of the vacuities and arches in the classification of the reptiles. He recognizes three chief types, perhaps three chief phyla: (1) the Cotylosauria, with unbroken temporal roof; (2) the type in which there are two vacuities and two arches; (3) the single-arched type, in which there is a single vacuity bounded below by the jugal and quadratojugal. He thinks that there may be a fourth type, that in which a vacuity is bounded below by the postorbital and the squamosal. He is, however, unable to see the distinction between the two types with a single vacuity, and is inclined to believe that all single-arched reptiles have arisen from a single type. The present writer is unable to understand clearly the position taken.

Inasmuch as the temporal roof is primitively, as in the Cotylosauria, complete and composed of two series of bones, it is the vacuities which developed in them that are the important matters to consider. It seems to the writer that a single vacuity may have originated in five different ways:

1. By the development of the upper vacuity alone.
2. By the development of the lower one alone.
3. By the appearance and extension of a vacuity in the postorbito-squamosal arch.
4. By the gradual reduction of the postorbito-squamosal bar, allowing the upper and the lower vacuities to unite.
5. By the reduction of the lower arch, leaving only the upper vacuity.

The matter may be further complicated by changes in the temporal roof such as are found in some of the turtles: (1) Its lower border may be eaten away, resulting finally in a condition such as appears to exist in *Varanosaurus;* (2) the hinder border

and upper part of the roof may by degrees disappear until there is left only a narrow lower arch; and even this may waste away. Among the turtles the modifications in the temporal roof, numerous and extreme as they are, are not regarded as of great importance. It may be different, however, among the other reptiles. If so, then, as it appears to the writer, there might be five phyla of reptiles possessing in the temporal roof a single vacuity.

It is to be hoped that Dr. Williston's researches will lead to a solution of the difficult problem involved in the higher classification of the reptiles.

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## FEDERLEY'S BREEDING EXPERIMENTS WITH THE MOTH PYGÆRA

INTERESTING results have recently been obtained by Federley[1] by breeding moths of the Notodontid genus *Pygœra*. Three common European species furnished the material—*P. curtula, P. pigra* and *P. anachoreta*.

The hybrids were not all equally easy to obtain. Numerous matings involving *P. anastomosis* were made, but no offspring were obtained. *Anachoreta* males show little inclination to pair with *curtula* females, but when such pairing occurs nearly all the eggs start developing, yet only a few reach the adult stage. On the other hand, the reciprocal mating (*curtula* male to *anachoreta* female) is easily accomplished, but produces only about 30 per cent. fertilized eggs. Of these most of the males and some of the females reach the adult stage. Thus it appears that "Paarungsaffinität" (tendency to mate), "sexuelle Affinität" (tendency toward fertilization) and "physiologische Affinität (tendency to produce fertile offspring) are independent.

One great difficulty met with was that the adult $F_1$ hybrids were very sterile. Only a single $F_2$ moth was raised, and only a few from the various back crosses ($F_1$ by $P_1$).

One of the characteristics of the species *anachoreta* is the presence of a white spot on the first abdominal segment of the caterpillar. In one of Federley's races of pure *anachoreta* there appeared, in the same brood, two caterpillars lacking the

[1] *Arch. Rass.- u. Gesellsch.-Biol.*, 8, 281, 1911. Reviewed also by M. Daiber, *Zts. ind. Abstamm.- u. Vererb.-Lehre.*, 6, 90, 1911.